



OBSERVATIONS ON WHITE PINE-BLISTER RUST IN GREAT BRITAIN AND DENMARK

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Observations on blister rust (*Cronartium ribicola* Fisch.) in Great Britain during the period from June to October, 1925, being incidental to the study of the *Phomopsis* disease of Douglas fir, were necessarily fragmentary and very limited. In Denmark, while only one place was visited, this was for the definite purpose of seeing blister rust conditions.

THE RUST IN GREAT BRITAIN

The disease came to notice first on June 9 in Bagley Wood near Oxford where a small plantation of eastern white pine (*Pinus strobus* L.) was very heavily infected. Of the trees from 3 to 8 inches diameter breast-high, many had already been killed, while the remainder were dying rapidly. Branch cankers were the exception, while stem cankers, in many cases just a foot or two above ground level, were abundant. The trees stood 100 to 150 feet distant from a few bushes of European black currant (*Ribes nigrum* L.) in a garden. Aecial sporulation was about over, while *uredinia* were just beginning to show as occasional spots on the currant leaves.

An opportunity was afforded here to compare the relative susceptibility of eastern white and Himalayan (*P. excelsa* Wall.) pines. Two trees of the first-named species about eight feet high were fully exposed to infected black currant bushes about 30 feet away. The trees had stem cankers and several branch cankers close to the stems. The two Himalayan pines of the same size as, same exposure to, and same distance from the black currants, were free from infection.

Uredinia and *telia* were very abundant on European black currants on September 2 at Westwick near Norwich. In one very heavily infected 10-acre block a new variety developed here and called the Davidson was relatively free from the rust. A second block of about 10 acres was similar to the above, while in a third block of 25 acres this variety also was very heavily infected. There were very few 5-needle pines on this estate, and the forester stated that 5-needle pines were rare in the surrounding country. Several Himalayan pines at some distance from the currants seemed free from infection, after a hasty

examination, as did two Swiss stone pines (*P. cembra* L.) about 500 yards from the second block of currants and relatively exposed. It is quite probable that these two stone pines belonged to the Alpine variety, *helvetica*, which as Spaulding (2, p. 44) has pointed out, is quite resistant. The amount and intensity of the infection on black currants at this place can be explained only by heavy uredinial spread, since the initial infection, if it came from pines, must have been light. The possibility of the rust overwintering on *Ribes* in this mild climate demands consideration.

One fact that stands out in relation to blister rust in Great Britain is the decided scarcity of wild *Ribes*, according to our standards. On some estates flowering red currant (*R. sanguineum* Pursh.) has been planted throughout the woods for its decorative value, but on the whole there are many places where 5-needle pines could be grown, the only protection necessary being the eradication of a few black currants. However, the British have abandoned the planting of 5-needle pines except for ornamental purposes. Even if the situation as outlined above were fully understood by the majority of foresters, there would be no change in the present attitude. In the first place, the black currant is highly esteemed. In the second place, British foresters feel that it is poor policy to plant an introduced species on a commercial scale when it is known beforehand that there will be an added charge against the species to protect it from a dangerous disease already established.

THE RUST IN DENMARK

The state forest of Almindingen comprises approximately 6,200 acres, in the central portion of the Island of Bornholm, a small, roughly circular island about 15 miles across, lying in the Baltic Sea about 100 miles east of Copenhagen. This place was visited by Moir in May, 1920, and by Spaulding in October, 1922, both of whom have given a brief account of conditions then (1, pp. 12-13, 17; 2, pp. 37-38). Eastern white pine, planted throughout the forest, both pure and in mixture with other conifers, has been practically ruined by blister rust and when seen by the writer in September, 1925, presented a depressing picture.

In the several compartments examined the white pines ranged from 3 to 14 inches diameter breast-high. Large numbers of trees have been killed and nearly all the living trees were infected, though occasional individuals apparently had escaped completely. All sizes were dying slowly but steadily, the death rate being slower than in

the earlier stage of the infection, since most of the small trees with cankers low on the trunk had been killed already. Many of the larger ones so infected were still living. Trees were very common with tops or even the entire crown broken off at cankers on the bole.

Stem cankers, abundant from butt to top, were indicated sometimes by distortion of the bole, but always by heavy resin flow. The dirty, black character of the bark or its dark green color due to a profuse growth of *algae* made the cankers more difficult to detect. A few twig infections were producing *pycnia*, others showed *pycnial* scars, and most of them had the characteristic yellowish-green discoloration of the bark at the youngest part of the canker except where this was obscured by the discolorations mentioned above.

Conditions are most favorable for blister rust, the relative humidity being high throughout the year, rainfall abundant at all seasons, and the winters mild. In addition, the low-lying, wet sites occupied by most of the white pine plantations are unfavorable to the tree species and favorable in a high degree to the parasite. Apparently heavy infection occurs periodically, and not yearly. Evidently such a wave of infection swept over the forest some years ago and the yearly infection since has been very light, the most recent cankers found being on 1920-1921 wood at the nodes. The white pines remaining were of low quality in all plots, because the stands have been so heavily thinned by blister rust that height growth has been reduced and the trees have not self-pruned. However, this is not of paramount importance since all but a very few trees will be killed before attaining maturity.

One noticeable point in this infection was the relatively few branch cankers in comparison to stem cankers. At Daisy Lake in British Columbia,—which place shares with this locality the doubtful honor of being one of the two worst examples of damage by blister rust now known,—the trees have enormous numbers of branch cankers, with very few stem cankers. At Daisy Lake, western white pine (*Pinus monticola* Dougl.) is the species attacked, while at Almindingen, eastern white pine is the victim. The writer's limited observations in New England also indicated relatively few branch cankers on eastern white pine.

During a three-day search no wild currants or gooseberries were found. The gardens of the small farms scattered throughout the forest and, in fact, over all the island, each contained a few European black currants, red currants, and often gooseberries. The black currants were heavily infected wherever examined but no rust was found on the red

currants and gooseberries. Evidently black currants alone are responsible for the pine infection in this forest. The most striking facts were the relatively small number of black currant bushes causing the heavy infection and the lack of significant difference in degree of infection between white pine stands 300 feet and those 3,300 feet from black currants. How much farther the disease might have spread from currant to pine can not be told, since no pine stands were found at a greater distance than the last-named figure. Conditions in this forest afford the most convincing proof of the terrific damaging power of the cultivated black currant. This currant can not be tolerated in a region where white pines are to be grown.

LITERATURE CITED

1. Moir, W. Stuart. 1924. White pine blister rust in western Europe. U. S. Department of Agriculture Bulletin No. 1186, 31 p., 15 fig., February 8.
2. Spaulding, Perley. 1925. Notes upon the white pine blister rust in Europe and upon conditions affecting its status there. Unpublished manuscript, 100 p., Office of Forest Pathology, U. S. Department of Agriculture, July 29.